

Assessment of Phytoplankton abundance of Ranchi Lake (Bada Talab)

ABSTARCT

Ranchi lake which is commonly known as Bada talab by the locals, which is made by a British soldier Colonel onely as a fresh water ecosystem. Ecosystem is the integration of both living and non-living organism. In an aquatic ecosystem there is a trophic level which comprises of producer mainly phytoplankton. Phytoplankton are the chief producers of an aquatic ecosystem. As a producer these planktons are the structural bodies of the trophic level because all living organisms present in this ecosystem largely dependent directly or indirectly to these planktons. The present paper deals with assessment of phytoplankton's which are mainly found in water bodies. According to assessments conducted at regular intervals, the majority of the phytoplanktonic species identified in Bada Talab are members of the Chlorophyceae, Bascilariophyceae, and Cyanophyceae classes. Therefore, it can be said that the best time frame for Cyanophyceae members to grow is April–June 2023, followed by January–March 2023 for Chlorophyceae and January–March 2023 for Bascilariophyceae. Microcystis, Spirogyra, Nostoc, Oscillatoria, Scendesmus, Pinnularia, and Volvox were the most prevalent species; these can be used as reliable indicators of pollution and water quality.

Keywords: Ecosystem, phytoplankton's, diatoms, algae

INTRODUCTION

The chemical formula of water is H_2O which is made up of three atoms i.e. two hydrogen atoms and one oxygen atom. Water is very essential for existence of life on earth for all living organisms. Plants largely depends on water for the process of photosynthesis. Light reaction requires water for electron transport and to generate ATP and NADPH which is the product of light reaction. Water is very essential for all those activities which are essential for life on earth^[4]. Every organism needs water for sustaining its life, it is quite significant for proper functioning of body. Polluted

water mainly affects the whole physiological process of our bodies. Excessive growth of phytoplanktons causes death of other organism of the ecosystem called eutrophication. Pollution largely affect the relation between growth rate and each of these variable^[5]. Biological parameters are generally used in assessing the quality of water body and pollution among different such parameters the algal flora has been used as an important tool in aquatic study^[1]. Regular assessment of phytoplankton's species are generally essential for pure water bodies and for such balanced ecosystem.

An aquatic ecosystem is a type of ecosystem which are found under the water body. This includes communities of organism that interact with each other. Periodicity and species composition of different phytoplankton in regular interval is essential for assesing the quality of water and such taxonomic groups were found to be related with fluctuations of the physicochemical parameter of the ecosystem^[2]. The two main types of aquatic ecosystem are basically marine ecosystem and fresh water ecosystem. In an any ecosystem there is a two component mainly biotic component and abiotic component. Biotic component includes autotrophic and heterotrophic organism. Autotrophic organism are mainly producers which are phytoplanktons, they mainly use solar energy to produce biomass from carbon. Heterotrophic organism are dependent on autotrophic organism directly or indirectly, after consuming or gaining energy these organism create their own biomass. Rajukumar and Ritakumari, (2004), Bai and Abraham,(2003) reported that species composition of phytoplankton communities differs and depends on the local climate, Soil and sewage like environmental factors which might be associated with differences among the species which depends upon the availability of nutrients and the degree of mixing or stratification^[3]. Various phytoplanktonic species which are found in these water bodies in different depth as well as surface water bodies. Algae also act as Biological indicator. Temperature is determining factor for phytoplankton size at both species as well as community level.

MATERIALS AND METHODS

The study was conducted in Ranchi lake also known as Bada Talab. Ranchi is an urban town in Jharkhand state, the river is located at latitude 23.36 and longitude 85.31. Samples were taken from the lake in regular interval of one year from January

2023 to December 2023. Samples were collected in the morning between 7 am to 9 am using phytoplanktons net of 5 mironmeter mesh size. After collection samples were transported to laboratory of DSPMU Ranchi were examined under binocular Microscope, for further identification various standard manuals are used for identification purpose ie; Dhargalker and Ingole, Hydromet, ICAR Fisheries development.

MAP OF RANCHI DISTRICT AND LOCATION OF BADA TALAB

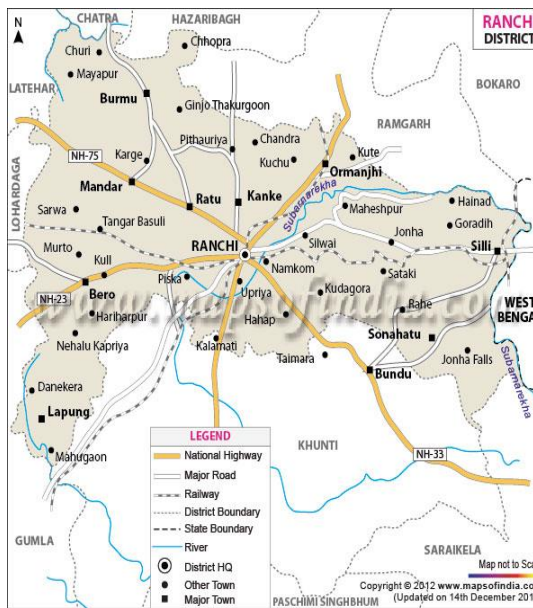


Fig.1: Map of Ranchi district

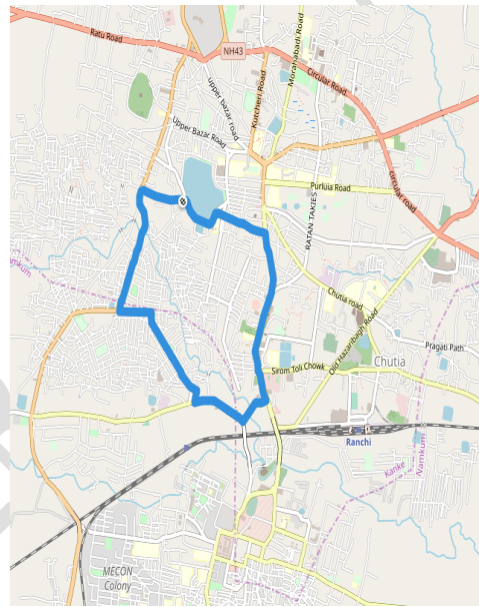


Fig.2: location of Bada Talab



Fig.3: Surface water collection



Fig.4: Under deep water collection

RESULTS & DISCUSSION

After regular interval of assessment it is found that the phytoplanktonic species mainly found in bada talab are belong to class Cyanophyceae, Chlorophyceae and Bascilariophyceae. Water sample were collected from bada talab, sample were taken from surface water as shown in figure 3 and also from under deep water as shown in figure 4.

Among Cyanophyceae there is 4 genera were recorded namely *Oscillatoria* sp., *Nostoc* sp., *Microcystis* sp. and *Anabaena* sp. Among chlorophyceae 5 genera were recorded namely *Scendesums* sp., *Fristchella* sp., *Volvox* sp., *Chlorella* sp. and *Spirogyra* sp. Among Bascilariophyceae 7 genera were recorded namely *Gomphonema* sp., *Navicula* sp., *Pandorina* sp., *Eunotia* sp., *Eudorina* sp., *Pinnularia* sp. and *Synedra* sp. Period from jan to march 2023 total genera found in Cyanophyceae are 3 ie., *Oscillatoria* S., *Nostoc* sp. and *Anabaena* sp. In Chlorophyceae all the 5 genera were found namely *Scendesums* sp., *Fristchella* sp., *Volvox* sp. , *Chlorella* sp and *Spirogyra* sp. In Bascilariophyceae all the 7 genera were found. Period from April to June 2021 all the four genera are found in Cyanophyceae, in Chlorophyceae 3 genera are present and in Bascilariophyceae 5 genera are found. Period from July to Sep 2021 there are 2 genera are recorded in Cyanophyceae, 3 genera in Chlorophyceae and 3 genera in Bascilariophyceae. Period from Oct to Dec 2021 there is 3 genera recorded in Cyanophyceae, 4 genera in Chlorophyceae and 4 genera in Bascilariophyceae.

Maximum number of genus in the class Cyanophyceae were observed during the period of April to June 2023 followed by Oct to Dec 2023, Jan to March 2023 and July to Sep 2023. Among Chlorophyceae maximum number of genus were observed during the period of Jan to March 2023 followed by Oct to Dec 2023, April to June 2023 and July to Sep 2023. Among Bascilariophyceae maximum number of genus were observed during the period of Jan to March 2023 followed by Oct to Dec 2023, April to June 2023 and July to Sep 2023. Phytoplankton have been used as biological indicators of water quality in ponds, lakes, and other aquatic ecosystems since the late 19th century ^[8]. For phytoplankton survival there is a major concern like ocean acidification, nutrient pollution, and global warming^[6]. Phytoplankton, despite constituting only about 1% of the total biomass of plants, perform roughly 50% of the Earth's photosynthetic carbon dioxide (CO₂) fixation and contribute to 50% of the planet's oxygen production ^[7]. Phytoplankton play a crucial role in estimating the primary production of aquatic ecosystems like ponds ^[9]. Study of phytoplankton is very much essential for primary productivity and it is very useful in assesment of fish yield and also carrying capacity of the pond ^[10]. Algae basically the autotrophs which occupies the first trophic level of an ecosystem and all others trophic level organism directly or indirectly depend upon them.

Table 1: Showing presence (+) and absence (-) of different genus in different period from jan to dec 2023.

Class	Order	Genus	Period from Jan to March 2023	Period from April to June 2023	Period from July to Sep 2023	Period from Oct to Dec 2023
Cyanophyceae	Nostocales	<i>Oscillatoria sp.</i>	+	+	-	+
Cyanophyceae	Nostocales	<i>Nostoc sp.</i>	+	+	+	+
Cyanophyceae	Chroococcales	<i>Microcystis</i>	-	+	+	-

		<i>sp.</i>				
Cyanophyceae	Nostocales	<i>Anabaena sp.</i>	+	+	-	+
Chlorophyceae	Sphaeropleales	<i>Scendesums sp.</i>	+	-	-	+
Chlorophyceae	Chaetophorales	<i>Fristchella sp.</i>	+	+	+	+
Chlorophyceae	Chlamydomonadales	<i>Volvox sp.</i>	+	+	+	-
Chlorophyceae	Chlorellales	<i>Chlorella sp.</i>	+	-	+	+
Chlorophyceae	zygnematales	<i>Spirogyra sp.</i>	+	+	-	+
Bascilariophyceae	Cymbellales	<i>Gomphonema sp.</i>	+	+	-	+
Bascilariophyceae	Pennales	<i>Navicula sp.</i>	+	+	-	+
Bascilariophyceae	Cymbellales	<i>Cymbella sp.</i>	+	-	+	+
Bascilariophyceae	Eunotiales	<i>Eunotia sp.</i>	+	-	+	-
Bascilariophyceae	Bacillariales	<i>Nitzschia sp.</i>	+	+	-	+
Bascilariophyceae	Naviculales	<i>Pinnularia sp.</i>	+	+	-	-
Bascilariophyceae	Fragilariales	<i>Synedra sp.</i>	+	-	+	-

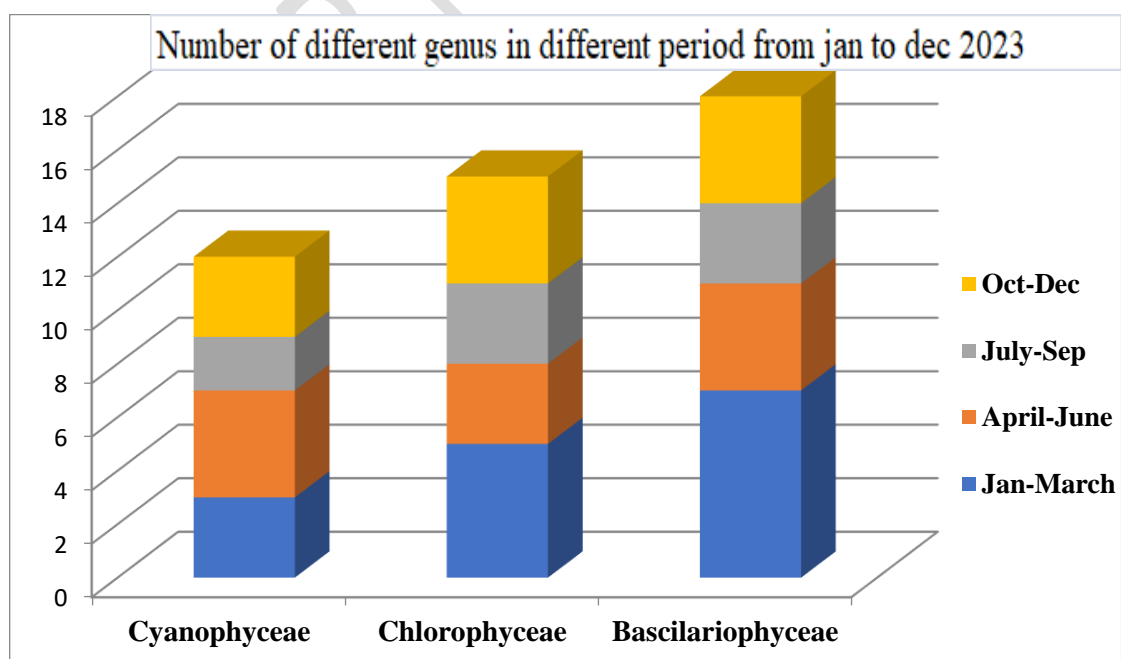


Fig 5:- Graphical representation of number of different genus in different period from Jan to Dec 2023.

CONCLUSION

From the above result and discussion, it can be concluded that the most favorable conditions for the growth of cyanophyceae members are the period from April to June 2023, while for chlorophyceae in Jan to March 2023 and for bascilariphyceae in Jan to March 2023. The species of Microcystis, Spirogyra, Nostoc, Oscillatoria, Scendesmus, Pinnularia and Volvox were dominant, and this can be used as good indicator species of water quality and pollution.

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